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ABSTRACT

Two projects concerning the relationship between management capability and communication activities are described; both are considered interdisciplinary projects. Involved were researchers and practitioners from engineering and natural science fields as well as those from the social and managerial sciences. The objectives of the research were to: (1) develop workable criteria for evaluating the effectiveness of large-scale interdisciplinary projects, and (2) identify those organizational and personnel management characteristics most highly related to these criteria. Benefits to be achieved are: (1) to assist in efficient allocation and conservation of Federal dollars, (2) development of an efficient internal operation geared to interdisciplinary research, (3) to develop harmonious working relationships within the university or other large institutions, and (4) to enhance the initiative (and morale) or personnel involved in research. (Author/EB)

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RELATIONS BETWEEN INTERDISCIPLINARY PROJECT MANAGEMENT AND PROJECT PERFORMANCE

D. A. Benton, N. S. Grigg and D. C. Taylor

The success of interdisciplinary projects is not guaranteed by the mere assemblage of an impressive set of names and individual capabilities and a problem posed for solution. Such a project has unique management requirements if there is to be reflected in the results a large degree of interdisciplinarity. Many such projects turn out to be only of collection of multidisciplinary studies which could probably have been funded separately as monodisciplinary studies and more frequently than not for a lot less money.

A well-conceived and well-managed interdisciplinary project must have built into it the capability of acieving a mix of people and exchange in ideas. This is usually done through provisions in the project for extra time and compensation for communication activities to take place and the management capability to insure that the communication does take place effectively and at the appropriate time and place within the project. It is, therefore, hypothesized that management characteristics of the leadership of a project are directly reflected in the final effectiveness of an interdisciplinary project.

Two projects that are studying this relationship are by coincidence housed at Colorado State University. They are both sponsored by the National Science Foundation - Research Management Improvement Program (NSF-RMIP). One project grant was to Colorado State University (CSU) and the other was to the Consortium of Colorado River Water Research Institutes and Centers (CWIC).

The projects were:

...CSU-RMIP Project - "Organization Structure and Personnel Management for Effective Interdisciplinary Research Projects"

...CWIC-RMIP Project - "Management of Large-Scale Interdisciplinary Research Projects"

Co-principal investigators for the CSU-RMIP Project are Dr. Douglas A. Benton, Associate Professor of Management and Director of Special Programs, College of Business; Dr. James R. Meiman, Professor of Earth Resources, College of Forestry and Natural Resources; Dr. Daryl B. Simons, Associate Dean of Research and Professor of Civil Engineering; and Dr. Douglas D. Sjogren, Professor of Education.

Principal investigator of the CWIC-RMIP Project is Dr. Norman A. Evans, Director, Environmental Resources Center, Colorado State University, and Dr. Neil S. Grigg, Associate Professor of Civil Engineering, is the Project Director.

It is interesting to note that both of the projects are interdisciplinary projects in themselves. They involve representative researchers and practitioners of the engineering and scientific field as well as representatives from various areas of social and managerial sciences.

As of this writing, both of the projects have developed a background of case study experiences from which some results can be inferred but both are in the process of collecting and analyzing social science data from which correlations can be pinpointed and described more rigorously.

Both projects are aimed at the study of interdisciplinary <u>research</u> projects. (Research being broadly defined to mean projects which the university is uniquely qualified to undertake in addition to its primary academic mission and for which outside funding is usually provided.)

It is felt that some of the results will apply to the understanding of the management of any interdisciplinary effort which requires the coordination of highly specialized and highly skilled intellectual inputs.

A brief description of each project follows:

CSU-RMIP Project - "Organization Structure and Personnel Management for Effective Interdisciplinary Research Projects"

The objectives of the research are: (1) to develop workable criteria for evaluating the effectiveness of large-scale interdisciplinary projects, and (2) to identify those organizational and personnel management characteristics most highly related to these criteria. The research approach involves an in-depth interdisciplinary team study of six projects at Colorado State University by interview, workshop, and questionnaire. The projects selected for study are:

The Grassland Biome Project which has representation of personnel in biological, mathematical and physical sciences. The objectives were to develop and conduct studies leading to the understanding of the structure, function, and utilization of a grassland ecosystem. Such an understanding is gained through the analysis of field and laboratory data, through biological synthesis, and the development of system simulation models.

The Regional Analysis and Management of Environmental Systems which has representation of personnel in range science, systems analysis, sociology, political science, economics, animal science, and botony. The objectives of the project are to develop and test unified models of resource ecology economics, and social goals useful in regional analysis and management of environmental systems.

The San Juan Ecology Project which has representation of personnel in plant ecology, forest genetics, forest physiology, forest mensuration, animal biology, wildlife ecology, microbiology, forest hydrology, ecology geomorphology, dendrochronology, and climatology. The objectives of the project are to determine the effect of snowpack variation on the major biotic and related physical ecosystem components which are of economical and social interest to men.

The Environmental Contamination Cause by Lead Project which has representation of personnel in mechanical engineering, civil engineering, atmospheric science, chemistry, botany and plant pathology, sociology, economics and zoology. The objectives of the project are to define the effects and flow of automotive lead in the environment, identify environmental problems caused by automotive lead, and formulate recommendations for solving these problems.

The Development of Design Procedures for Wood Joist Structural Systems Project which has representation of personnel from civil engineering and forestry and wood sciences. The objectives of this project is to deveop and quantify a previously developed and verified mathematical model of the behavior of wood joist systems.

The Water Management Research Project in Arid and Subhumid Lands of the Less Developed Countries which has representation of personnel in agricultural engineering, agronomy, economics and sociology. The general objectives of this project is to increase food production of the less developed countries through the improvement of water management practices and their integration with good management and cultural practices.

The six projects selected all involve large-scale natural resource studies and involve a total of approximately 80 professionals and a combined funding in excess of 16 million dollars over the duration of the projects. The benefit from the project will be information useful in formulating effectiveness criteria and planning organizational and personnel management approaches for large-scale interdisciplinary projects. Immediate payoff will result by direct application of the findings to the projects involved in the study.

To date, the project has resulted in the creation and validation of research effectiveness criteria through an invitational workshop and preparation of a review paper for publication. A method of describing and factually documenting managerial characteristics has been developed and tested. Data collection is nearing completion. Methods of analyses have been developed and are being perfected. Preliminary videotape presentations have been prepared and utilized in their present form by the sponsor and others.

Additional and final results from the investigation will be presented in a documented report accompanied by five videotapes explaining the approach and findings.

Expected Significance

The benefits to be achieved by developing a model for management for large projects are several: (1) to assist in the efficient allocation and conservation of Federal dollars, (2) development of an efficient internal operation geared to interdisciplinary research, (3) to develop harmonious working relationships within the University or other large institutions, and (4) to enhance the initiative (and morale) of personnel involved in that research.

Specifically, the results relative to the process of selecting effectiveness criteria for interdisciplinary research projects should be of direct benefit to those engaged in funding and management of such research. Although not all the effectiveness criteria selected would be expected to gain universal acceptance, the careful documentation of the selection process should provide valuable information for those faced with similar problems. The relations between personnel satisfaction and project characteristics should be directly applicable to a wide range of interdisciplinary projects.

CWIC-RMIP Project - "Management of Large-Scale Interdisciplinary Research Projects"

This investigation is concerned with ways and means of improving the performance of large-scale interdisciplinary research projects. It is an inquiry into the effectiveness of organization and management practices which are being used, or have been used, among the 20 leading universities in the southwest region of the United States. Characteristics of organization and management practices will be measured for approximately 30 projects in the seven Colorado River Basin States. Correlation-regression, Factor analysis and other valid methods of analyses will be applied to the data. Approximately 30 project performance variables will be tested against approximately 150 organization/management variables.

The specific problem of this investigation is to discover whether a relationship does, in fact, exist between interdisciplinary project administration/management and project performance. If an association between these two factors can be established, then the details of organizational arrangements and of managerial practices that relate to performance will

be examined. With an understanding of these multi-variate relationships, recommendations could be formulated which would improve the expectation of successful accomplishment from large-scale interdisciplinary projects.

Three major groups will be involved in the conduct of this study: (1) major management responsibility will be carried by a Principal Investigator and a Project Manager; (2) a Central Staff Group will carry out central responsibilities in research design and data analysis; and (3) a State Data Group will have the crucial task of performing on-site studies, collecting case data, and assisting the Technical/Scientific Group in analyzing the data.

The final report will include an executive summary section which can be distributed independently of the main report. Additionally, scientific and professional publication papers will be submitted as appropriate. State-wide symposia will be conducted in each of the seven states to convey preliminary recommendations to potential users.

Not part of this proposal, but suggested as strategy for further dissemination are regional seminars to be given at about completion of the study. Further, a summer institute (one week) on interdisciplinary research administration should be offered.

To date the project has evolved a preliminary model upon which data needs and related instruments for gathering data have been developed. Approximately 30 interdisciplinary projects spread over seven states have been selected and investigated on a preliminary basis. Project questionnaires are being administered through the state leaders and data results are just beginning to be catalogued. Some project difficulties have been experienced in developing adequate communication between the many parties involved. The solution to these difficulties has been to increase formal and informal communication between all groups through meetings, workshops, and memorandums.